

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
7 November 2002 (07.11.2002)

PCT

(10) International Publication Number
WO 02/089263 A1

(51) International Patent Classification⁷: **H01R 12/04**

[US/US]; Apartment T5, 20 Westgate Plaza, Woburn, MA 01801 (US). **BAUER, Eric** [US/US]; 10 Strawberry Bank Road, #18, Nashua, NH 03062 (US).

(21) International Application Number: PCT/US02/12570

(22) International Filing Date: 23 April 2002 (23.04.2002)

(74) Agents: **STEVENS, Richard, L.** et al.; Samuels, Gauthier & Stevens, Suite 3300, 225 Franklin Street, Boston, MA 02110 (US).

(25) Filing Language: English

(26) Publication Language: English

(81) Designated States (*national*): JP, US.

(30) Priority Data:
60/285,774 23 April 2001 (23.04.2001) US

(84) Designated States (*regional*): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR).

(71) Applicant (*for all designated States except US*): **TRANSITION AUTOMATION, INC.** [US/US]; Building 5, 101 Billerica Avenue, N. Billerica, MA 01862 (US).

Published:

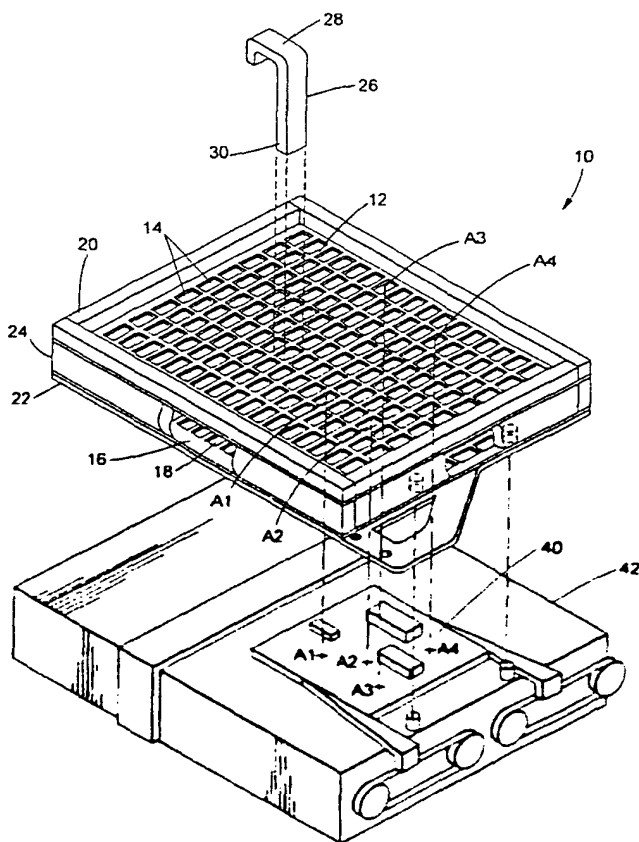
- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **CURTIN, Mark**

[Continued on next page]

(54) Title: FINE RESOLUTION PIN SUPPORT FIXTURE WITH LIGHT WEIGHT DESIGN



(57) Abstract: A pin support structure (10) comprising a first foil (12) having opening (14) and a second foil (16) having openings (18). The first foil (12) is secured to a foil support frame (20) and the second foil (16) is secured to a foil support frame (22). The foils (12, 14) are maintained in spaced apart relationship by a separation frame (24). The holes (14) of the foil (12) are in registration with the holes (18) of the foil (16). The holes in the foils (12, 16) are formed by electro-chemical etching. A pin (26) has a base end (28) and a support end (30).

WO 02/089263 A1

Title

Fine Resolution Pin Support Fixture with light weight design

Background of the InventionField of the Invention

- 5 A pin support fixture for supporting the side of a pc board which side has electronic components thereon.

Discussion of the Relevant Art

In pc board assembly, electronic components are mounted on both sides of the board. When components are mounted on a first side, side 1, the other side, side 2, is simply supported on a planar surface. To mount components on side 2 the card is inverted. Side 1 with the components can be supported on a mirror image molded surface but usually a table or fixture having pins extending upwardly therefrom supports the board. The pins contact the side 1 where there are no components (otherwise referred to as a 'bare board' location). The positioning of the pins is
15 generally through a 'blind' selection process. Pins are randomly inserted and if they contact the side 1 after being inserted a known distance from the plate to the surface of the side 1 they are secured. Most methods require machined metal tables and the total pin support fixture is generally about twenty (20) pounds.

Brief Summary of the Invention

- 20 Broadly the invention comprises a pin support fixture which eliminates the 'blind' pin selection process of the prior art and is light weight, e.g. five (5) pounds, for ease of handling.

Broadly, the invention comprises two suspended foils each having a large array of finely spaced holes, two foil support frames, and a separation frame. When
25 assembled, the holes of the foils are in registration.

The two etched metal foils allow a fine resolution of holes to be created, without the concomitant increase in cost or manufacturing time, associated with increasing the resolution of a common metal plate with holes machined in place as in the prior art.

- 30 The high density of holes, 0.13 inch pitch versus 0.4 inch pitch for prior art

Description of the Preferred Embodiment(s)

Referring to Fig. 1, a fixture is shown generally at 10 and comprises a first foil 12 having openings 14 and a second foil 16 having openings 18. The first foil 12 is secured to a foil support frame 20 and the second foil 16 is secured to a foil support frame 22. The foils are maintained in spaced apart relationship by a separation frame 24. The holes 14 of the foil 12 are in registration with the holes 18 of the foil 16. The holes in the foils are formed by electro-chemical etching. A pin 26, only one shown in Fig. 1 for clarity, has a base end 28 and a support end 30.

Aligned below the fixture 10 is a pc board 40 which is secured in position in a pc board support structure shown generally at 42. The structure 42 and the alignment of the board 40 to a pc board structure is well known in the art and need not be described in detail.

Board support locations on the pc board 40 are shown as A1 through A4. Corresponding pin locations which would pass through the apertures 14/18 are identified as A1 through A4. After a suitable number of support pins 26 have been positioned, pins are secured, as will be described for Fig. 2. The fixture is then inverted and inserted into the production machine.

Referring to Fig. 2, the fixture 10 is shown in greater detail in its support/inverted position. A magnetic plate 44 is attached to the frame 20 and the base end 28 of the pin 26 to secure the pin 26 in position. For accuracy, the pin 26 is received in the holes 14/18 in sliding, frictional engagement to ensure there is no lateral displacement of the pin 26 while the magnetic plate 44 ensures there is no vertical displacement of the pin.

The foil 16 (the foil 12 being identical thereto) is shown in greater detail in Fig. 3.

In a preferred embodiment, square holes are etched through the foil in an 84 x 115 array, typically 84 rows by 115 columns, totaling 9660 discrete support locations. The plate is stainless steel 0.012 inches thick. The square holes have sides 0.1 inches and are spaced apart from one another vertically and horizontally by 0.03 inches. The plates 12 and 16 are spaced apart 0.75 inches. This geometric configuration allows an operator to 'see through' the fixture 10 to position or place the pin 26. With this example, other geometric configurations are within the scope of the invention.

The invention has been described with reference to square holes, a particular configuration of a pin having a U-shaped base with the bases of the pins being secured by a magnetic plate. Configuration of the pins/holes could be other geometric

Having described my invention what I now claim is:

- 1 1. A pin support fixture which comprises:
2 an upper apertured foil;
3 a lower apertured foil;
4 means for maintaining the foils in spaced apart relationship, the apertures of the
5 foils being in registration; and
6 a plurality of pins having a support end and a base end, the support end passing
7 through an aperture in the upper foil and the base end resting against a backing plate.
8
- 1 2. The fixture of claim 1 wherein the geometry of the fixture is configured
2 such that it can be seen through for pin placement.
- 1 3. The fixture of claim 1 wherein the means for securing the pins is a
2 magnetic plate.
- 1 4. The fixture of claim 1 wherein the base end is U-shaped.
- 1 5. The fixture of claim 1 wherein the pins and holes are dimensioned to
2 prevent lateral displacement of the pins when they are received in the holes.
- 1 6. The fixture of claim 1 wherein the means for maintaining in spaced-
2 apart relationship is a spacer frame.

1/3

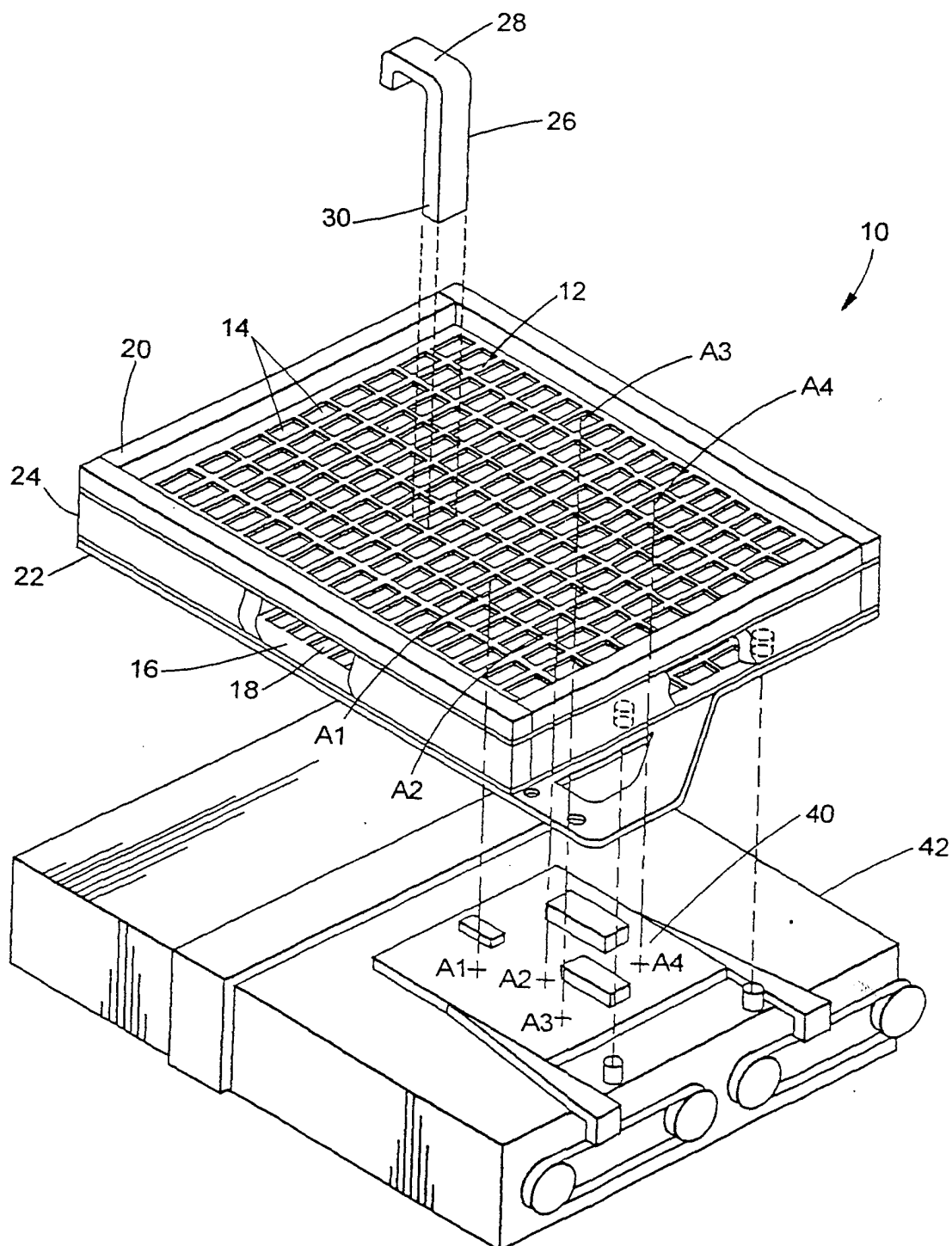


FIG. 1

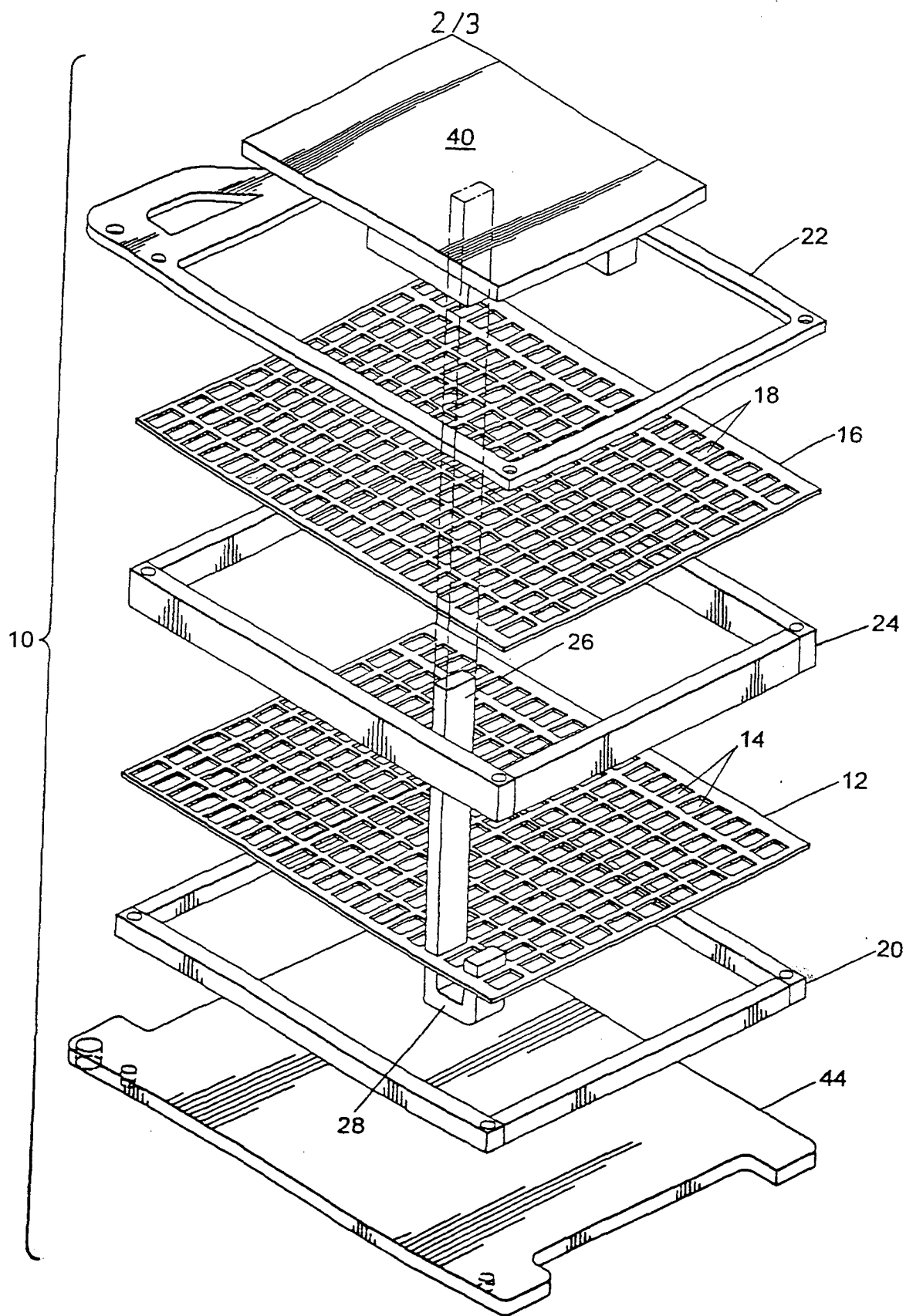


FIG. 2

SUBSTITUTE SHEET (RULE 26)

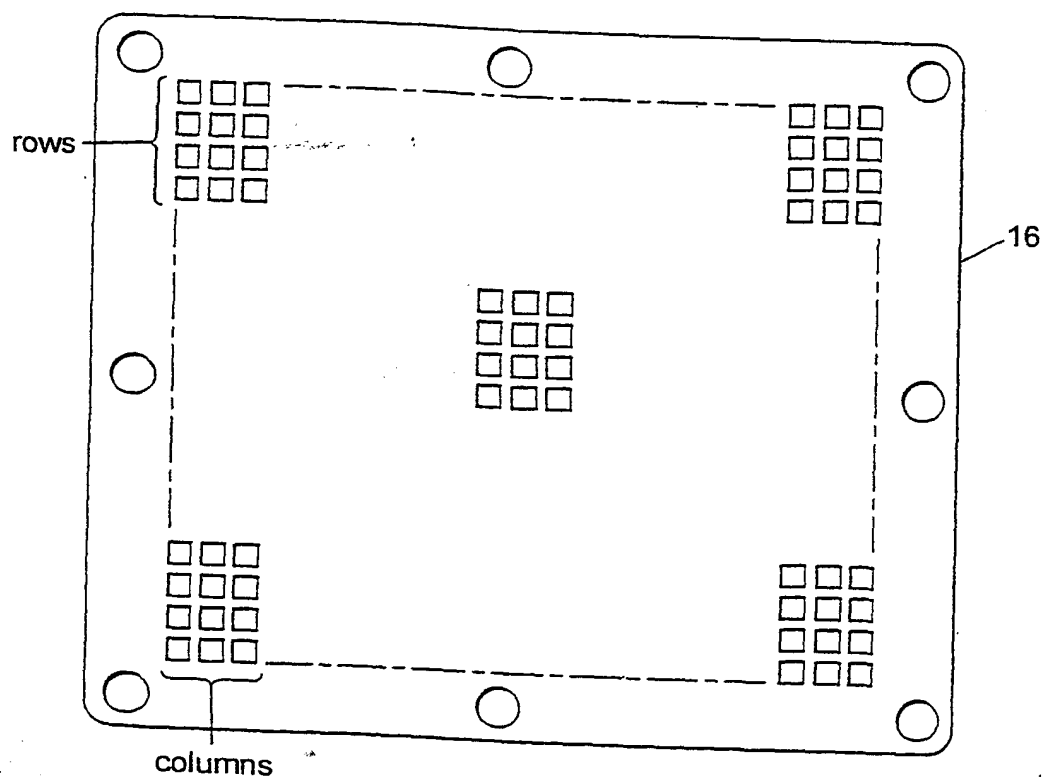


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/12570

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H01R 12/04

US CL : 439/55, 79, 74, 81-82, 342

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 439/55, 79, 74, 81-82, 342

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,950,173 A (MINEMURA et al) 21 August 1990 (21.08.1990), see entire document.	1-6
Y	US 3,670,409 A (REIMER) 20 June 1972 (20.06.1972), see entire document.	1-6
Y	US 3,619,478 A (STAIGER) 09 November 1971 (09.11.1971), see entire document.	1-6

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

12 September 2002 (12.09.2002)

Date of mailing of the international search report.

20 SEP 2002

Name and mailing address of the ISA/US

Commissioner of Patents and Trademarks

Box PCT

Washington, D.C. 20231

Facsimile N . (703) 305-3230

Authorized officer

TRUC NGUYEN

Telephone N . (703) 308-1920

Truc Nguyen